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ABSTRACT

Instruments used in a study by M. B. Kinzie and M. A. Delacourt (1991), the Attitude towards Computer Technologies (ACT) and the Self-efficacy for Computer Technologies (SCT), assess preservice teachers' perceived usefulness of and comfort level with specific computer technologies. This study uses a population confirmed to be similar to that used by Kinzie and Delacourt and a similar two-pronged approach to study the evaluation of teacher education programs that are implementing specific computer literacy content. Data were obtained from students across courses and over three semesters in a representative teacher education program in a small private liberal arts college. In all, 58 students were assessed using a single computerized instrument, the Computer Confidence/Self-efficacy Scale that combines features of both previous instruments. Data reveal that the Computer Confidence/Self-efficacy Scale is a highly reliable instrument for measuring the levels of confidence of preservice teachers under the conditions of a teacher education program. The instrument must be interpreted under the assumptions of a construct or computer confidence that consists of general computer confidence and efficacy and specific computer competence and efficacy as identified in the course focus. Appendixes present the scale itself, significant group differences by selected group variables, and bar graphs of the mean scores for specific categories. (Contains 14 tables, 5 appendix tables, 6 appendix figures, and 25 references.) (SLD)

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Preservice Teachers' Computer Literacy: Validation of an Instrument to Measure Self-efficacy for Computer-based Technologies

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Short Biography

Dr. Frank M. Buhendwa, currently Assistant Professor of Education at Ferrum College at Ferrum, Virginia, has a Bachelor's Degree from the University of Zaire (1973), a Postgraduate Diploma from Ealing Technical College (London, 1977), a Master's Degree in TESOL from Northern Illinois University, Dekalb,Il. (1988), and an Education Doctor (Ed.D) degree in Curriculum and Instruction from Illinois State University, Normal, Illinois (1994). His major areas of study are curriculum and instruction design and evaluation. He is teaching Foundations of Education courses and Strategies for Middle and High School preservice teachers. His other interests and research publications include multicultural issues and the integration of new technologies in learning and teaching.

SUMMARY

Many studies have already explored the range of knowledge, skills and attitudes needed for preservice and inservice teachers. Results from current research on teachers' computer literacy indicate that there still is a need for developing computer-based technology literacy in both prospective and career teachers. Research data also witness to the fact that teachers are ill-prepared to take advantage of the computers they find at their disposal when they enter a teacher education training institution or begin their career in schools. A need to redesign the teacher preparation curricula and instructional designs is recommended for exploration.

The teacher candidates' computer literacy must be identified by using appropriate measures. Some current studies are trying to identify good instruments for needs assessment both at the formative and summative levels of the teacher preparation process. Because of the observed positive correlation between computer knowledge, attitude and use, however, data about computer attitudes and confidence in the ability to use computer-based systems are most needed information for redesigning teacher preparation. Teachers' attitudinal orientation towards computer-based systems can be expressed in terms of concerns about computerized systems as technological innovations (Ciccelli & Baecher, 1989), but they may be better represented as levels of confidence or sense of self-efficacy about the use of such technologies. However, researchers are still uncertain as to whether a unitary factor or the multiple factor theoretical construction of teacher's preparedness should be adopted.

The instrument used by Kinzie & Delcourt (1991), the Attitude towards Computer Technologies (ACT), assesses perceived usefulness of and comfort/anxiety with computer technologies, and the second measurement, the Self-efficacy for Computer Technologies (SCT), assesses perceived Self-efficacy for specific computer technologies and its subscales were found to be reliable. The dual mode of the computer Confidence/Self-efficacy with computer technologies, which was assumed by Kinzie and Delcourt's study, has been adopted in this study as well. Such construction considers Self-efficacy or Confidence with technologies as manifested in a dual mode: the "General Confidence/Self-efficacy" and "Specific or Domain-related Confidence or Self-efficacy" and that there is a relationship between both types of confidence but they are not the same. Data gathered by Kinzie & Delcourt revealed a high reliability of instrument when applied to teacher education students. The issue of unitary and multiple factors remained to be examined for the ACT/SCT items, if they were to be adopted as one instrument. It was also to be determined whether the scale would be reliable when used in the computerized format, which was preferred by design for the Education Courses in the program under study.

This study of the instrument attempts do obtain such information, using a similar population as the one used in the Kinzie & Delcourt study. Data from this study may be a basis for the adoption of one instrument (the Computer Confidence/Self-Efficacy Scale) for the evaluation of teacher education programs which are implementing specific computer literacy content in teacher education courses. This paper reports the findings about the general characteristics of the population for which such an instrument was being tested. The general level of scores on the instrument and the reliability of the instrument as well as the assumption of a multiple factor construction of Computer Confidence/Self-efficacy are checked. The data were obtained from students across courses in a representative teacher education program and over three semesters spanning between Fall 1994 and Fall 1995 in a small private liberal arts college environment in the South-Eastern USA.

Preservice Teachers' Computer Literacy: Validation of an Instrument to Measure Self-efficacy for Computer-based Technologies

Introduction

There are a lot of studies that have already explored the range of competencies (knowledge, skills attitudes) needed for teachers both in preservice and inservice career conditions (Furlong, 1983), among which stands out the ability to select and evaluate software, using computers to revise and edit lesson plans, write to parents, keep records, and prepare tests, access databases, and assuming the role of instructional computing designer and coordinator. Ness (1991) has identified similar competencies, which were recommended by the most recent National Conference on Computer Education (NCCE) for the 1990's after the previous guidelines of that conference for the 1980's were reviewed by that same body. The NCCE set of competencies is comprehensive of teacher competencies as defined in some other most recent literature (Duckett, 1995).

Results of four questionnaires that evaluated skills before the course and after one year of teaching with students were obtained in a study by Sanders (1992). The prospective teachers had just completed a primary post-graduate certificate of education course indicate the needs for developing computer technology literacy in prospective teachers. Ellis & Kuerbis

(1991) have indicated such needs for a curriculum for preparing science teachers to use microcomputers in a project called ENLIST Micros as a means to improve quality and intensity of microcomputer use in science teaching.

Questions continue to be raised (Wilson, 1990) concerning the preparedness of teacher trainees for computer utilization and the issue is growing worldwide. For example, in Wilson's recent Australian study, it was observed that the majority of students were positively inclined but ill prepared to take advantage of the computers they find at their disposal when entering a teacher education training institution. A redesign of the teacher preparation curricula and instructional designs was recommended for an exploration of solutions.

To obtain effective instructional designs for teachers' preparedness for computer-based technologies, the teacher candidates' computer literacy (knowledge, skills and attitudes) needs to be identified using appropriate measures. There are ongoing studies that are trying to identify good instruments for needs assessment both at the formative and summative levels (Dologite, 1988). In many of these instruments, rather than gauging computer "knowledge," the measurement of computer attitudes is preferred as being most helpful in providing needed information input for program redesign. The choice is based on the indications from many studies that computer knowledge and attitude often correlate positively (Bitter & Davis, 1985). For instance, in the Bitter & Davis's study of 240 Arizona teachers,

the results revealed a positive correlation between attitude and knowledge level, with teachers indicating an appreciation for classroom computers and expressing interest in expanding their knowledge. These teachers were enrolled in computer education classes when the study was conducted.

One aspect of the attitudinal orientation of teacher candidates is expressed in terms of attitudes and levels of confidence in user's ability, also known as "Self-efficacy." However, the number of factors to be posited in the instrumentation about teacher's confidence about technologies and self-efficacy for their use in education has not been determined yet. As a result, researchers are still uncertain whether a unitary or a multiple factor theoretical construct is to be adopted. For example, Poage (1991) views the degree of confidence about computerized technologies and their use in education as operating on a variety of factors and suggests that the construct may be examined either under one or many factors. Using Likert-style items to be scored on the Agreement/ Disagreement continuum, his study of a 16-item confidence scale obtained a standardized alpha coefficient of .78. The identified five factors are: (1) confidence in classroom performance, (2) confidence in abilities to learn new materials or techniques, (3) confidence in hardware usage and repairs, (4) confidence in knowledge of content area subject matter, and (5) confidence in abilities to learn using alternative learning styles. Yet it

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appears that the areas examined by Poage, especially under his first, second, fourth and fifth factors, may be less direct measures of attitudes, beliefs or self-efficacy about technology. Poage's concerns were more focused on confidence in learning and using "technology as an innovation."

Torardi (1985) also reported a study of a "criterion-referenced" test instrument developed at IOWA, known as the Standardized Test of Computer Literacy (STCL). Results from the validation of the final 80-item test indicate that the STCL was both a valid and reliable measure of computer literacy. However, Torardi did not elaborate on the issue of confidence/self-efficacy for the teachers as users of computer-based technologies and little is known about the validity of the instrument itself.

But, since the 1980's, more and more instruments have been developed with a focus on attitudes and beliefs about computers, without attempting to interpret those attitudes and beliefs as levels of confidence or indicators of self-efficacy. Most studies have attempted to establish each instrument usefulness for teacher preparation in preservice college environments by identifying the instrument reliability, establishing factorial validity, and examining fit to a unidimensional model (Ellsworth & Bowman, 1982; Paprzycki & Vidakovic, 1994; Kluever et al., 1992; Troutman, 1991).

Among the attitudes scales that have been recently implemented is the instrument developed by Kluever and colleagues

(1992). In this pretest/posttest study of inservice teachers, mentoring teachers took workshops, and after 9 months a self-evaluation of teaching skills including computer use were conducted. There are suggestions from results that their Computer Attitude Scale (CAS) was a reliable instrument for measuring teachers' attitudes toward and impressions of the educational applications of computers, that it could be used as a total score or separated into four related subscales, and that it yielded pretest and posttest differences which could be interpreted as one indicator of the effect of training in the use of computers in schools; and finally it was suggested that the instrument gave useful pretest data for the identification of potential training emphases regarding teachers' attitudes about computers.

Troutman (1991) also examined attitudes toward personal and school use of computers using two scales, the Attitude Toward the Use of Computers in Schooling (ATSC) and the Attitude Toward Personal Use of Computers (ATPC). The ATPC was a measure of more general attitudes. However, scores on both measurements were highly correlated (.80) and reliability and stability was obtained with a Cronbach alpha coefficient of .97 for RATC and .90 for RATPC, which supported the unitary factor for the interpretation of the results. Troutman concluded that those who feel "secure about their own personal use of computers also feel positive towards the use of computers in schools" (p. 285). Most

items on the two measures can be easily paired with the items on the CAS (Kluever et al., 1992) and the ACT/STC (Kinzie & Delcourt, 1991). Therefore, a high correlation between this instrument and the CAS or the ACT/STC or any similar scale should be expected if both were applied under similar conditions.

Paprzycki & Vidakovic (1994) developed their Attitudes Towards Computers Scale in order to examine prospective teachers' attitudes toward computers as well as differences between prospective teachers and populations from other majors. However, only nine questions were probing the respondents' current feelings about computers. The rest of the instrument gauged intensity of feelings about owning, roles of computers and attitudes towards learning and attitude towards the course.

The structure of the confidence or self-efficacy measurement, which is proposed in this study as the basis of the instrumentation, was initially developed and studied by Kinzie & Delcourt (1991) who took a slightly different perspective for the interpretation of teacher's literacy from the one that is suggested in this study. Both preservice and in-service teachers were used as subjects. The measurements in this study linked attitudes and self-efficacy toward computer use and used a two-part instrument. The first part, the Attitudes toward Computer Technologies (ACT), posited the attitudes as manifested through two factors: perceived usefulness of and comfort/anxiety with computer technologies. The second measurement, the Self-efficacy

for Computer Technologies (SCT), assessed the preservice teacher's perceived Self-efficacy for specific computer technologies (word processing, electronic mail, and CD-ROM databases). The administration of theses two instruments indicated evidence for retaining the concept of the two factors of comfort/anxiety and usefulness for the ACT, and the three empirically identified factors for the STC mirrored the concepts of word processing, electronic mail, and CD-ROM data bases. Subscales for both instruments were found to be reliable. Results of regression analyses suggested that actual experience with computer technologies was a strong predictor of attitudes and Self-efficacy and that computer use correlated with the degrees of confidence and the kind of attitudes towards computerized technologies.

The instruments used by Kinzie and Delcourt, were found a more interesting set to be used as an assessment tool in a program which aimed at enhancing both the general literacy levels and introduce students to exploring the use of specific media in their connection to teaching and learning. The instrument by Kinzie & Delcourt (1991) has a two-pronged focus. The general attitudes are gauged by the Attitudes toward Computer Technologies (ACT), which assesses perceived usefulness of and comfort/anxiety with computer technologies in general, and the specific attitudes measured by the Self-efficacy for Computer Technologies (SCT), which assesses perceived Self-efficacy for

specific areas of application of the computer technologies (word processing, electronic mail, and CD-ROM databases). For the sake of interpreting computer confidence/self-efficacy, this study considers only two levels of confidence or self-efficacy: the general use of Computers and domain-specific confidence/self-efficacy.

Data gathered earlier by Kinzie & Delcourt (1991), who used a paper-and-pencil instrumentation, revealed a reliability alpha coefficient of .89 for the ACT (with 2 subscales of Anxiety/Comfort .90, and usefulness .83). The self-efficacy for specific technologies was separately examined and reliability coefficients of .97, .98 and .98 were found for wordprocessing, E-Mail and databases respectively. The reliability for the ACT/SCT as a whole was not calculated since the one-factor construct was "a priori" ruled out on purely logical grounds. The issue of unitary and multiple factors remained to be examined for the ACT/SCT items, if they were to be adopted as one instrument. It was also to be determined whether a similar scale, to be named the Computer confidence Scale, would be reliable when used in a different administration format than the paper-and-pencil used for the ACT/STC. By design, the computerized format was the preferred administration format for the Computer Confidence Scale to be used in the education courses in the program under study.

Theoretical Considerations

The Computer Confidence/SElf-efficacy Scale is an improvement on the ACT/STC in many ways. While agreeing with a multiple factors construct of Computer Self-efficacy, I am assuming in this study that there is a sense of self-efficacy with computers and computerized data systems in general, which was gauged by the ACT, and a sense of domain-specific computer efficacy which was gauged by the STC. On the other hand, the number and format of items as well as the number of domains for the specific self-efficacy were reexamined for reason that are explained under the section on instrument. Such changes were brought to the contents of the ACT/STC to make this new Computer Confidence/ Self-Efficacy Scale.

This study of the instrument attempts to obtain information about measurement reliability and validity, and assumes a similarity between the student population in this program and the population studied in the Kinzie & Delcourt study, which will be used for comparison. Early studies have indicated differences of performance on a variety of computer literacy measurements for variables such as college, gender, major, prior ccmputer experience or use habit, and anxiety (Kinzie & Delcourt, 1991; Liao, 1994; Liu, Reed & Phillips, 1992; Loyd & Cressard, 1984, 1995, 1996; Loyd & Loyd, 1988, 1986; Morahan, et al., 1992).

Questions

The present study was conducted to try to answer the following three sets of questions:

General Characteristics

(1a) What are the general characteristics of the population for which the computerized Computer Confidence/Self-efficacy Scale was applied?

(1b) What are the characteristics of the population with regards to the features measured by the Computer Confidence Scale?

Instrument Reliability

(2) Is the instrument internally consistent and reliable as a whole and in its parts in its computerized administration and how do scores on this instrument compare with results obtained from the previous study of a similar instrument using a similar?

(3) Is the Computer Confidence Scale reliable and stable across courses and over different semesters of application to teacher education students?

Instrument Validity

(4) Is the unitary factor or a multiple factor preferable when the Computer Confidence Scale is used for formative purposes?

(5) Do preservice teachers' scores on the Computer Confidence Scale differ for specific groups such as gender, age,

computer use or previous knowledge, based on the theoretical assumptions supported by previous studies of the computer confidence for preservice teachers?

Method

Setting and Participants

Students enrolled in the teacher preparation program in a small liberal arts college in the Southeast were used in this study. They were taking the teacher education sequence courses which focused on issues and concerns about self and society in the initial stage in Education as their "minor." Meanwhile, they along with their Education 202 and Education 301 courses, they were continuing their involvement in the content area courses as requirements for their baccalaureate major. They represented a mix with a majority of traditional undergraduate students and a few returning second-career students as found in small liberal art colleges in a rural, predominantly white community in the South-Eastern USA. A very small percentage of the group were transfer students from neighboring public community colleges. The teacher candidates were either sophomore, junior or senior at the time they enrolled in the education sequence (The Handbook, 1995). Most candidates had a GPA equal to or above 2.50 on admission into the teacher education program and had been

required to maintain a GPA of 3.00 in their teacher education curriculum.

The Instrument (The Computerized Computer Confidence/Self-efficacy Scale)

The content of the items in this version of the Computer Confidence Scale instrument was based on the contents of the items used and tested by Kinzie & Delcourt (1991). The presentation of response to item choices as well as the wording of items in the Self-efficacy part of the instrument were modified. The final two-part instrument was administered by a computer. Forty-six items (see Appendix 1) were prepared as short text files to be viewed on a computer screen. Answer choices were expressed in terms of agreement/disagreement on a five-point scale instead of the four point-scale used by the Kinzie & Delcourt's paper and pencil instrument. The five-point scale was preferred to the four-point scale because it offered a possibility for a middling (Neither/Nor) position at score 3, which would stand in the theoretically constructed position for the Zero position on a bell curve. The first part was conceptualized as the "General Self-efficacy for Computer Technologies" (GENUSE) and the second part was focused on three specific areas of computer use in education as targeted by the course designer of Education 202 and Education 301. This part

focused on text treatment (WPUSE), use of computer communications (COMUSE), and quantifiable data treatment (DTBSPRED). A fourth area, multimedia in learning and teaching, was not represented in the corpus for items, even though competencies in that area were targeted in the two courses.

The scores for strong agreement were coded as 1 (least desirable) and strongest disagreement with the statements was coded as 5 (most desirable orientation) after applying the necessary re-coding.

Procedures

The instrument questions and alternative choices appeared on the monitor screen with appropriate instruction for proceeding within the program. The instrument items are presented as Appendix 1. The instrument was administered at the beginning of the semester to obtain the data for the on-going research. Then the teacher candidates were exposed to learning activities in an instructional design which focused on issues of education, integrated with involvement with technology (for Education 202) and Historical/social/philosophical foundations also integrated with specific uses of computerized technology (for Education 301 students). The integration of computer technologies in the course design reflected features of Javetz's conceptual approach (Javetz, 1991) and Bauer & Ellefsen 's "anchored instruction"

model in those two preservice education courses.

The Computer Confidence Scale instrument was administered to the preservice teachers in each of the Education-202 and Education-301 classes during the semesters spanning Fall 1994 and Fall 1995. The two courses are offered in a sequence. In all, the sample totalled 58 students by Fall 1995.

Statistical Design and Hypotheses

The general population characteristics and response to instrument were examined through descriptive statistical data (frequencies, count, mean and standard deviation) but no specific test statistic was run for this part. A reliability test was run on the 46 items and on all four sections of the instrument, with all items entered using the SPSS V4.0 statistical package for PC's using the RELIABILITY procedure.

After re-coding all items so that all desirable levels of confidence were value "5" and the least desirable levels were "1" for both positively and negatively worded items, the items for general attitude or comfort with computers were labelled GENUSE. The items for self-efficacy with specific technologies were variables and were labeled as following: WPUSE for efficacy or comfort using the wordprocessor, COMUSE for comfort or efficacy using computerized communications systems, and DTBSPRED for comfort or efficacy using spreadsheets and databases.

Investigation of instrument validity was performed by using a correlation check between the instrument as whole and the scores on the parts of the instrument, as well as an analysis of variance on a variable of interest.

Hypotheses. The following hypotheses were formulated for the study:

(1) There is no difference between the general characteristics and response pattern of the population for which this instrument was used and the ones obtained about similar populations with regard to the features measured by the Computer Confidence Scale?

(2) There is no relationship among scores on the items of the whole instrument and the scores on the total instrument. There is no relationship among scores on the items of each part and the total scores on the parts.

(3) There is no relationship between items on the whole scale and on the parts of the Computer Confidence Scale across courses or over different semesters of instrument application to teacher education students.

(4) There is no relationship between scores on the total instrument and scores on the parts of the instrument (to support the adoption of either a unitary or a multiple factor construct for the instrument).

(5) There is no difference of scores between teacher education students based on their level of computer use or previous experience.

Analyses The reliability check was conducted first on each part of the instrument under the assumption of a multiple factor, then, on the whole instrument under the assumption of a unitary factor. The appropriate procedure for default alpha levels and summary statistics was applied. To determine the theoretical construct validity of the instrument, a correlation was used to see the degree of relationship between all parts of the Computer Confidence Scale and the whole instrument, and the correlation of each part with all other parts of the instrument. Also an analysis of variance of scores on instrument based on the variable of computer use (GNCOMPUS) was made to find if results the theoretical position of researchers on computer confidence/Self-efficacy.

Results

General Population Characteristics and Response to Instrument.

The general characteristics of this group, considered as a sample of potential teacher education candidates for which this instrument was being developed, had to be found. The similarity

between this group as a sample and populations involved in previous studies was to be examined with regard to the features measured by the instrument. Frequencies, means and percentages were obtained first on the general features of the population. The counts and frequency distributions of the sample are shown in Table 1 below.

Table 1: General features of the sample of teacher education students

	Value Label	f	Percent	Cum Percent
TERM	Fall	46	79	79
	Spring	12	21	100
COURSE	Educ-202	48	83	83
	Educ-301	10	17	100
GENDER	Male	18	31	31
	Female	40	69	100
AGE	18-20 Years	30	52	52
	21-25 Years	17	29	81
	25 Years or More	11	19	100
ETHNICIT	Non-Whites	9	16	16
	Whites	49	84	100
CLASSRNK	Sophomore	30	52	52
	Junior	18	31	83
	Senior	10	17	100
TEACHARE	Fine Art/PE	14	24	24
	Math/Sciences	9	16	71
	Languages	18	31	55
	Social Studies	17	29	100
GNCOMPUS	Occasional Use	30	52	52
	Weekly	18	31	83
	Daily	10	17	100
HSDIVERS	Low Mix	7	12	12
	Middle Mix	5	9	21
	High Mix	45	79	100

Note. Low = 0-10% minorities; Middle =11-25% minorities; High= 26% or more minorities

To find the characteristics of the population with regards to the features measured by the Computer Confidence/Self-Efficacy Scale the means, standard deviations were produced on all the items and for each sub-category within the sample. The general trend in the scores on the instrument is reported in Tables 2 through 5 below. As a group, the preservice teachers were above average in their scores on the general attitude part of the instrument (GENUSE) as indicated by the data in Table 2 with score 3.79 being above the midpoint of the scale values.

Table 2: General features of the Computer Confidence Scale scores Teacher Education Students for GENUSE

VAR	LABEL	MEAN	STD DEV	CASES
TERM	Entire Group	3.7931	.7436	58
	Fall	3.7174	.7502	46
	Spring	4.0833	.6686	12
COURSE	Entire Group	3.7931	.7436	58
	Educ-202	3.8333	.7244	48
	Educ-301	3.6000	.8433	10
GNCOMPUS	Entire Group	3.7931	.7436	58
	Occasionally	3.4667	.7303	30
	Weekly	4.0000	.5941	18
	Daily	4.4000	.5164	10
GENDER	Entire Group	3.7931	.7436	58
	Male	3.8333	.6183	18
	Female	3.7750	.8002	40
AGE	Entire Group	3.7931	.7436	58
	18-20 YEARS	3.7000	.7944	30
	21-24 YEARS	4.0000	.7071	17
	25-30+ YEARS	3.7273	.6467	11

(table continues)

Table 2: General features of the Computer Confidence Scale scores Teacher Education Students for GENUSE

VAR	LABEL	MEAN	STD DEV	CASES
CLASSRNK	Entire Group	3.7931	.7436	58
	Sophomore	3.9000	.8449	30
	Junior	3.5556	.7048	18
	Senior	3.9000	.3162	10
ETHNICIT	Entire Group	3.7931	.7436	58
	Non-Whites	3.7778	.8333	9
	Whites	3.7959	.7354	49
HSDIVERS	Entire Group	3.7895	.7497	57
	Low Mix	4.1429	.8997	7
	Medium Mix	3.8000	.4472	5
	High Mix	3.7333	.7508	45
TEACHARE	Entire Group	3.7931	.7436	58
	Fine Art & PE	3.6429	.7449	14
	Languages	3.6111	.9164	18
	Math/Sciences	4.3333	.5000	9
	Social Studies	3.8235	.5286	17

Note. Low Mix= 0 to 10% Minorities; Medium Mix= 11-25% Minorities High Mix= 26% Minorities or more; Entire Group= Valid cases

The scores on the measurement of confidence with Wordprocessing concepts and use were even much higher on the scale than the scores on confidence on general use. The group's score of 4.2 was a lot higher than the scale midpoint, as indicated by the data in Table 3.

Table 3: General features of the Computer Confidence scores for WPUSE

VAR	LABEL	MEAN	STD DEV	CASES
TERM	Entire Group	4.2586	.9470	58
	Fall	4.1304	1.0024	46
	Spring	4.7500	.4523	12
COURSE	Entire Group	4.2586	.9470	58
	Educ-202	4.2292	1.0156	48
	Educ-301	4.4000	.5164	10
GNCOMPUS	Entire Group	4.2586	.9470	58
	Occasional	3.8333	.9855	30
	Weekly	4.5556	.7838	18
	Daily	5.0000	.0000	10
GENDER	Entire Group	4.2586	.9470	58
	Male	4.2222	.7321	18
	Female	4.2750	1.0374	40
AGE	Entire Group	4.2586	.9470	58
	18-20 YRS	4.3667	.9279	30
	21-24 YRS	4.3529	.6063	17
	25-30 YRS	3.8182	1.3280	11
CLASSRNK	Entire Group	4.2586	.9470	58
	Sophomore	4.3333	1.0933	30
	Junior	4.0556	.8024	18
	Senior	4.4000	.6992	10
ETHNICIT	Entire Group	4.2586	.9470	58
	Non-Whites	4.2222	1.0929	9
	Whites	4.2653	.9304	49
HSDIVERS	Entire Group	4.2456	.9502	57
	Low Mix	4.7143	.4880	7
	Medium Mix	4.8000	.4472	5
	High Mix	4.1111	1.0050	45
TEACHARE	Entire Group	4.2586	.9470	58
	Fine Art&PE	4.1429	.6630	14
	Languages	4.0000	.9701	18
	Math/Sci.	4.7778	.4410	9
	Social Stud.	4.3529	1.2217	17

Note. Low Mix= 0 to 10% Minorities; Medium Mix= 11-25% Minorities High Mix= 26% Minorities or more; Entire Group= Valid cases

However, the data on the use of computerized communications systems (COMUSE) indicated a lower than average level of

confidence and use, as indicated by their mean score of 2.3. The data are shown in Table 4 below.

Table 4: General features of the Computer Confidence Scores for COMUSE

VARIABLE	LABEL	MEAN	STD DEV	CASES
TERM	Entire Group	2.3448	1.1479	58
	Fall	2.1087	1.0161	46
	Spring	3.2500	1.2154	12
COURSE	Entire Group	2.3448	1.1479	58
	Educ-202	2.2708	1.1059	48
	Educ-301	2.7000	1.3375	10
GNCOMPUS	Entire Group	2.3448	1.1479	58
	Occasionally	1.9333	.9072	30
	Weekly	2.4444	1.0416	18
	Daily	3.4000	1.3499	10
AGE	Entire Group	2.3448	1.1479	58
	18-20	2.3000	1.0554	30
	21-24	2.5294	1.3284	17
	25-30	2.1818	1.1677	11
CLASSRNK	Entire Group	2.3448	1.1479	58
	Sophomore	2.5667	1.2507	30
	Junior	2.0000	.9701	18
	Senior	2.3000	1.0593	10
ETHNICIT	Entire Group	2.3448	1.1479	58
	Non-Whites	2.6667	1.2247	9
	Whites	2.2857	1.1365	49
HSDIVERS	Entire Group	2.3509	1.1571	57
	Low Mix	2.4286	.9759	7
	Medium Mix	1.6000	1.3416	5
	High Mix	2.4222	1.1578	45
TEACHARE	Entire Group	2.3448	1.1479	58
	Arts/PE	1.9286	.8287	14
	Languages	2.4444	1.2935	18
	Maths/Science	2.7778	1.2019	9
	Social Studies	2.3529	1.1695	17

Note. Low Mix= 0 to 10% Minorities; Medium Mix= 11-25% Minorities High Mix= 26% Minorities or more; Entire Group= Valid cases

The groups's score on the Confidence/Self-efficacy with

regard to the use of computer databases and spreadsheets was middling, with an average score around the midpoint of the scale (2.7) as indicated by the data in Table 5.

Table 5: General features of the Computer Confidence scores for DTBSPRED

VARIABLE	LABEL	MEAN	STD DEV	CASES
TERM	Entire Group	2.7069	1.0924	58
	Fall	2.4783	.9601	46
	Spring	3.5833	1.1645	12
COURSE	Entire Group	2.7069	1.0924	58
	Educ-202	2.6042	1.0466	48
	Educ-301	3.2000	1.2293	10
GNCOMPUS	Entire Group	2.7069	1.0924	58
	Occasionally	2.3333	.9589	30
	Weekly	2.8333	.9235	18
	Daily	3.6000	1.2649	10
GENDER	Entire Group	2.7069	1.0924	58
	Male	2.7222	.6691	18
	Female	2.7000	1.2445	40
AGE	Entire Group	2.7069	1.0924	58
	18-20 YRS	2.7000	1.2360	30
	21-24 YRS	3.0000	1.0000	17
	25-30 YRS	2.2727	.6467	11
CLASSRNK	Entire Group	2.7069	1.0924	58
	Sophomore	2.8667	1.2243	30
	Junior	2.3889	.8498	18
	Senior	2.8000	1.0328	10
ETHNICIT	Entire Group	2.7069	1.0924	58
	Non-Whites	2.8889	1.3642	9
	Whites	2.6735	1.0486	49
HSDIVERS	Entire Group	2.6842	1.0882	57
	Low Mix	3.1429	1.2150	7
	Medium Mix	2.6000	1.5166	5
	High Mix	2.6222	1.0289	45
TEACHARE	Entire Group	2.7069	1.0924	58
	Fine Arts&PE	2.5000	.8549	14
	Languages	2.6111	1.0369	18
	Math &Science	3.0000	1.4142	9
	Social Sci.	2.8235	1.1851	17

Note. Low Mix= 0 to 10% Minorities; Medium Mix= 11-25% Minorities High Mix= 26% Minorities or more; Entire Group= Valid cases

Under the assumption of the whole instrument being a measurement of a single construct, the group's mean was also above average on scores on the total instrument variable called TOTAL as indicated by the data in Table 6.

Table 6: General features of the Computer Confidence Scale for TOTAL

VARIABLE	LABEL	MEAN	STD DEV	CASES
GENDER	Entire Group	4.1816	.4385	58
	Male	4.2033	.3101	18
	Female	4.1719	.4886	40
AGE	Entire Group	4.1816	.4385	58
	18-20	4.1706	.4777	30
	21-24	4.2084	.3252	17
	25-30	4.1703	.5128	11
TERM	Entire Group	4.1816	.4385	58
	Fall	4.1790	.4489	46
	Spring	4.1917	.4144	12
COURSE	Entire Group	4.1816	.4385	58
	Educ-202	4.2160	.4633	48
	Educ-301	4.0168	.2451	10
GNCOMPUS	Entire Group	4.1816	.4385	58
	Never	3.6677	.5947	5
	Occasionally	4.1094	.3851	25
	Weekly	4.3282	.3725	18
	Daily	4.3552	.4064	10
CLASSRNK	Entire Group	4.1816	.4385	58
	Sophomore	4.1964	.5239	30
	Junior	4.1441	.3375	18
	Senior	4.2047	.3377	10

Note. Low Mix= 0 to 10% Minorities; Medium Mix= 11-25% Minorities High Mix= 26% Minorities or more; Entire Group= Valid cases

For program evaluation and assessment purposes, the researcher was interested in scores on the variables TOTAL,

GENUSE, COMUSE, DTBSPRED by groups identified by class. Also the previous knowledge or use habit (GENCOMPUS) was important to monitor. The mean scores on those variables are displayed in the figures in Appendix 3.

Reliability of Instrument.

To find if the reliability of the instrument was obtained in this administration format and whether the instrument's reliability coefficient would be different from the one obtained in the previous instrument study, a reliability check procedure was applied, using the statistical package SPSSPC V.4.0. Each part and the whole Computer Confidence/Self-efficacy Scale were examined. The reliability data for the GENUSE are presented in Table 7 below. The Cronbach alpha levels are indicated for each item and for the total instrument.

Table 7: Reliability for items of GENUSE

ITEM ID#	MEAN IF ITEM DELETED	VARIANCE IF ITEM DELETED	ITEM-TOTAL CORREL.	SQUARED MULTIPLE CORREL.	ALPHA for INSTRUMENT IF ITEM DELETED
ITEM1001	68.2414	128.3618	.7325	.7267	.9245
ITEM1002	68.2414	142.2565	.2011	.3614	.9345
ITEM1003	68.6552	126.4404	.7239	.7026	.9248
ITEM1004	68.2241	133.2647	.6496	.6219	.9266
ITEM1005	67.8448	137.5720	.5708	.6258	.9284
ITEM1006	68.5000	124.8158	.8172	.7826	.9223
ITEM1007	68.0690	136.7320	.3966	.4740	.9318
ITEM1008	68.7069	124.6670	.7771	.8277	.9234
ITEM1009	68.1379	141.8052	.2545	.4296	.9332
ITEM1010	68.5172	135.4471	.4848	.5054	.9298
ITEM1011	68.4828	121.9734	.8539	.9094	.9213
ITEM1012	68.8448	123.5720	.8037	.8620	.9227
ITEM1013	67.9483	138.1201	.6121	.6288	.9282
ITEM1014	68.5172	127.5523	.8198	.7760	.9227
ITEM1015	68.1724	134.9522	.5801	.5836	.9279
ITEM1016	68.1379	136.4368	.5871	.7009	.9280
ITEM1017	68.0690	134.7671	.6900	.7145	.9264
ITEM1018	68.5172	124.8155	.8556	.8413	.9215
ITEM1019	68.0345	141.1567	.2819	.3438	.9329

Note. GENUSE items N=19; Instrument coefficient = .9306

The reliability coefficients for the four sections of the domain-realted parts of the instrument are indicated in Table 8 through 11 below. The Cronbach alpha for the confidence or self-efficacy with the wordprocessing and related concepts is indicated in Table 8.

Table 8: Reliability for items of WPUSE

	MEAN IF ITEM DELETED	VARIANCE IF ITEM DELETED	ITEM-TOTAL CORREL.	SQUARED MULTIPLE CORRELA.	ALPHA FOR INSTRUMENT IF ITEM DELETED
ITEM2001	37.3276	61.4522	.7167	.5500	.9471
ITEM2002	37.5517	59.2692	.8125	.7747	.9431
ITEM2003	37.3448	60.7211	.8960	.8310	.9416
ITEM2004	37.8276	56.1101	.8191	.7530	.9430
ITEM2005	38.0000	57.0175	.8029	.7858	.9435
ITEM2006	37.3103	59.8669	.8414	.8538	.9424
ITEM2007	38.0000	58.8421	.6346	.5039	.9525
ITEM2008	37.3621	60.0596	.7896	.7702	.9442
ITEM2009	37.3966	57.1207	.8867	.8346	.9395
ITEM2010	37.8621	57.1736	.7897	.7193	.9442

Note. WPUSE items N=10; Instrument coefficient = .9494

The reliability coefficient for the self-efficacy or confidence with communications systems (COMUSE) is indicated by the Cronbach alpha values in Table 9 below.

Table 9: Reliability for items of COMUSE

	MEAN IF ITEM DELETED	VARIANCE IF ITEM DELETED	ITEM-TOTAL CORREL.	SQUARED MULTIPLE CORRELA.	ALPHA FOR INSTRUMENT IF ITEM DELETED
ITEM2011	21.5345	23.4462	.9445	.9374	.5713
ITEM2012	21.4310	22.0390	.9737	.9862	.5503
ITEM2013	21.4310	22.1794	.9723	.9864	.5522
ITEM2014	21.5862	23.2644	.9721	.9664	.5660
ITEM2015	21.5000	22.2544	.9681	.9716	.5537
ITEM2016	21.6724	24.2943	.8492	.9887	.5918
ITEM2017	21.6724	24.6803	.8371	.9949	.5972
ITEM2018	20.1379	48.8227	-.9174	.9907	.8672
ITEM2019	20.2069	50.3424	-.9384	.9284	.8803

Note. COMUSE items N=9; Instrument coefficient = .7099

The reliability coefficient for the self-efficacy or confidence with spreadsheets and databases is indicated by the Cronbach alpha values in Table 10 below.

Table 10: Reliability for items of DTBSPRED

	MEAN IF ITEM DELETED	VARIANCE IF ITEM DELETED	ITEM-TOTAL CORREL.	SQUARED MULTIPLE CORRELA.	ALPHA FOR INSTRUMENT IF ITEM DELETED
ITEM2020	22.9310	51.5390	.7236	.6135	.9005
ITEM2021	23.1034	50.6558	.7395	.7081	.8991
ITEM2022	23.2759	48.9752	.8399	.9025	.8902
ITEM2023	23.2069	50.0968	.7915	.8781	.8947
ITEM2024	23.0345	50.1742	.8290	.7877	.8918
ITEM2025	23.4310	51.1267	.6917	.6041	.9034
ITEM2026	23.1724	52.2154	.6866	.7011	.9036
ITEM2027	23.4655	56.7444	.4283	.4004	.9238

Note. DTBSPRED items N=8; Instruments coefficient= .9126

The reliability coefficient for the self-efficacy or confidence level when all items are considered as a single instrument (Unitary construct) is indicated by the Cronbach alpha values in Table 11 below.

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Table 11: Reliability for all items as one instrument

	MEAN IF ITEM DELETED	VARIANCE IF ITEM DELETED	ITEM-TOTAL CORREL.	ALPHA FOR INSTRUMENT IF ITEM DELETED
ITEM1001	160.4310	337.2671	.6688	.8613
ITEM1002	160.4310	358.4601	.1609	.8696
ITEM1003	160.8448	332.0983	.7185	.8596
ITEM1004	160.4138	345.4047	.5641	.8640
ITEM1005	160.0345	353.5777	.4068	.8668
ITEM1006	160.6897	329.1301	.8170	.8579
ITEM1007	160.2586	354.2653	.2395	.8687
ITEM1008	160.8966	329.7084	.7589	.8586
ITEM1009	160.3276	358.2241	.1903	.8692
ITEM1010	160.7069	347.2985	.4580	.8653
ITEM1011	160.6724	324.5048	.8535	.8563
ITEM1012	161.0345	327.0865	.8053	.8575
ITEM1013	160.1379	354.4368	.4255	.8669
ITEM1014	160.7069	336.4915	.7338	.8606
ITEM1015	160.3621	346.4105	.5493	.8644
ITEM1016	160.3276	352.0838	.4253	.8664
ITEM1017	160.2586	347.5635	.5954	.8644
ITEM1018	160.7069	331.1933	.7992	.8586
ITEM1019	160.2241	358.1770	.1857	.8693
ITEM2001	159.8448	343.4316	.6107	.8632
ITEM2002	160.0690	336.9074	.7510	.8606
ITEM2003	159.8621	342.3666	.7396	.8622
ITEM2004	160.3448	333.3176	.6770	.8604
ITEM2005	160.5172	334.0436	.6919	.8603
ITEM2006	159.8276	342.3908	.6429	.8627
ITEM2007	160.5172	340.8155	.4880	.8641
ITEM2008	159.8793	343.6168	.5791	.8635
ITEM2009	159.9138	336.0100	.7103	.8606
ITEM2010	160.3793	332.6606	.7240	.8597
ITEM2011	161.9310	342.3460	.4748	.8645
ITEM2012	161.8276	342.0048	.4309	.8652
ITEM2013	161.8276	342.5662	.4240	.8653
ITEM2014	161.9828	345.4208	.4046	.8658

(table continues)

Table 11: Reliability for all items as one instrument

	MEAN IF ITEM DELETED	VARIANCE IF ITEM DELETED	ITEM-TOTAL CORREL.	ALPHA FOR INSTRUMENT IF ITEM DELETED
ITEM2015	161.8966	342.2698	.4320	.8652
ITEM2016	162.0690	348.8724	.3187	.8675
ITEM2017	162.0690	348.3460	.3414	.8670
ITEM2018	160.5345	382.7093	-.4432	.8810
ITEM2019	160.6034	385.4014	-.4704	.8826
ITEM2020	160.7069	370.3863	-.1600	.8771
ITEM2021	160.8793	368.8799	-.1269	.8769
ITEM2022	161.0517	373.7692	-.2211	.8789
ITEM2023	160.9828	373.5962	-.2210	.8786
ITEM2024	160.8103	375.4546	-.2657	.8789
ITEM2025	161.2069	367.8863	-.1067	.8768
ITEM2026	160.9483	377.4885	-.3035	.8798
ITEM2027	161.2414	381.7302	-.3918	.8813

Note. Total Instrument items N=46; Instrument alpha coefficient = .8823

To find if the reliability levels of the instrument were maintained for the instrument in the new administration format with specific groups, the reliability test procedure was also performed on the data across groups. The specific groups of interest were term, gender, course, and previous use or knowledge of computers (GNCOMPUS). Table 12 indicates the different values of the reliability coefficient of the total instrument and its parts for the specified groups.

Table 12: Reliability coefficient for total instrument and parts by term, course, gender, age and gncompus

	CRONBACH ALPHA				
GROUP	TOTAL (N=46)	GENUSE (N=19)	WPUSE (N=10)	COMUSE (N=9)	DTBSPRED (N=8)
TERM 1	.9618(46)	.9389(46)	.9537(46)	.9843(46)	.8852(46)
TERM 2	.9436(12)	.8691(12)	.8006(12)	.9927(12)	.9269(12)
COURSE 1	.9625(48)	.9294(48)	.9575(48)	.9875(48)	.8994(48)
COURSE 2	.9722(10)	.9332(10)	.8155(10)	.9927(10)	.9526(10)
GENDER 1	.9361(18)	.8997(18)	.9131(18)	.9783(18)	.7818(18)
GENDER 2	.9686(40)	.9371(40)	.9584(40)	.9914(40)	.9321(40)
GNCOMPUS 2	.9539(30)	.9229(30)	.9574(30)	.9911(30)	.9238(30)
GNCOMPUS 3	.9405(28)	.8990(28)	.8768(28)	.9843(28)	.8747(28)
AGE 1	.9639(30)	.9281(30)	.9374(30)	.9897(30)	.9484(30)
AGE 2	.9575(17)	.9305(17)	.9018(17)	.9854(17)	.8333(17)
AGE 3	.9677(11)	.9286(11)	.9813(11)	.9928(11)	.8181(11)

Note. ( ) = Number of cases in the group; N= Number of items in instrument part

Issues of Validity.

To find if there was a relationship between scores on the total instrument and the parts, and among the parts of the instrument itself, a Pearson correlation was run with scores on all parts and scores on the total instrument as variables. It was to be found whether there was no relationship between and among the scores on the total set of items in the Computer Confidence instrument and the parts of the instrument (GENUSE, WPUSE, COMUSE and DTBSPRED). Such relationship would help to support the adoption of either a unitary (with a significantly strong relationship) or a multiple factor (with a strongly weak

relationship). The obtained results for relationship between parts and the whole instrument are shown in Table 13 below.

Table 13: Correlation for instrument parts and whole instrument

Variable	Cases	Mean		Std Dev	CORRELATION GENUSE
	TOTAL	GENUSE	WPUSE	COMUSE	DTBSPRED
TOTAL	1.0000	.7237**	.6671**	.7129**	.6960**
GENUSE	.7237**	1.0000	.5756**	.3728*	.3344*
WPUSE	.6671**	.5756**	1.0000	.4330**	.4307**
COMUSE	.7129**	.3728*	.4330**	1.0000	.5297**
DTBSPRED	.6960**	.3344*	.4307**	.5297**	1.0000

Note. N of valid cases= 58; (*) = 1-tailed significance $p<.01$; (**)= one-tailed significance $p<.001$;

As the data in Table 13 indicate, all parts are predictive of the total at a significant level ($p> .001$, $r = .7$). However the only strong positive correlation is between WPUSE and GENUSE; all parts of the scale have a weaker correlation among themselves ($r = .5$ or lower).

Moreover, the theoretical construction of Computer Confidence and Self-efficacy as being dependent on computer use and previous knowledge is indicated by the data drawn for specific groups within the teacher education student population. According to theory established by previous research, individuals with higher rate of use (weekly or daily users) had significantly higher and positive confidence and sense of self-efficacy than the people with no experience or low users (occasional use or

never use) both in general and for specific domains of use of computer-based technologies (See Table 14). The t-test analysis of the data is based on levels of computer use (GNCOMPUS), the data on other group variables are reported in detailed tables under Appendix 2.

Table 14: Analysis of Variance for Total Score on the Computer Confidence Scale for GNCOMPUS

VAR	SOURCE OF VAR	Sum of Squares	D.F.	Mean Square	F	Sig.
GENUSE	Between Groups	7.6506	2	3.8253	8.8153	.0005*
	Within Groups	23.8667	55	.4339		
WPUSE	Between Groups	12.5096	2	6.2548	8.9097	.0004*
	Within Groups	38.6111	55	.7020		
COMUSE	Between Groups	16.3923	2	8.1962	7.6781	.0011*
	Within Groups	58.7111	55	1.0675		
DTBSPRED	Between Groups	12.4506	2	6.2253	6.1618	.0038*
	Within Groups	55.5667	55	1.0103		

Note. *=Significant at p< 0.05

Discussion

This study of the instrument is an attempt to obtain information about the teacher education students under the assumption of similarity between this program's student population and the population studied in the Kinzie & Delcourt study. The hypothesis of no difference was supported by the data. The group on which the data were collected exhibited

similar characteristics as the ones obtained for the population in the Kinzie & Delcourt study with regards to the features measured by the Computer Confidence Scale. Moreover, the students in teacher education exhibit a level of confidence and sense of self-efficacy slightly higher than average in general, but weak in specific areas, as indicated by their scores on the five-points Confidence/Self-efficacy scale (see graphically represented data in Figures 1 through 6 in Appendix 3).

Kinzie & Delcourt's paper-and-pencil instrument revealed a reliability alpha of .89 (with 2 subscales of Anxiety/Comfort .90, and usefulness .83). The prospective teachers' self-efficacy for specific technologies was separately examined and reliability coefficients of .97, .98 and .98 were found for wordprocessing, E-Mail and databases respectively. The hypothesis of no relationship between items and total scores on instrument and its parts is not supported. Also the alpha levels obtained in the study of each part of the computerized Computer Confidence Scale compare with and the ones obtained from the previous study of this instrument. The coefficient for the instrument parts in this study were .93 for GENUSE, .94 for WPUSE, .70 for COMUSE and .91 for DTBSPRED.

The reliability of instrument was to be examined also for different groups in the sample. The hypothesis of "no relationship of scores on items and total instrument across courses and over semesters of instrument application to teacher

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education students" was not supported by the data. The reliability levels for groups identified by semesters, courses, gender, and use habit compared with the reliability coefficients obtained for the whole sample. The Cronbach alpha values were above .90 for all identified sub-categories.

The reliability for the ACT/SCT as a whole was not calculated in the Kinzie & Delcourt study (1991) and the multiple factor construct was not empirically examined. The issue of unitary and multiple factors remained to be examined for the Computer Confidence/Self-efficacy Scale items. It was to be determined empirically through the test of relationship between scores on parts of instrument and scores on total instrument. The hypothesis of "no relationship between the total and the parts of the instrument" was rejected in the test of relationship between parts and total instrument. All parts correlated with the total instrument scores. However, even though scores on all parts predicted highly scores on the total instrument, scores on the instrument parts were not strongly correlated among themselves, with the exception of GENUSE and WPUSE. This indicates that a multiple factor construct must be adopted for the instrument. There is a reality to be called "General Computer Self-efficacy " and three "Domain-specific Computer Self-efficacy" which can and must be measured and interpreted separately.

In the Kinzie and Delcourt study of the instrument as well

as other studies of teacher's attitude, beliefs, confidence/self-efficacy and computer use, it was suggested that actual experience with computer technologies was a strong predictor of attitudes and Self-efficacy and that computer use or previous experience with computers correlated positively with the degrees of confidence and the kind of attitudes towards computerized technologies. These findings were supported in this study when the differences in the levels of confidence were examined for the category GNCOMPUS with scores on general computer knowledge and use, wordprocessing, communications and databases/spreadsheet.

Conclusions

As these data revealed, the Computer Confidence/Self-efficacy Scale in its computerized format is a highly reliable instrument for measuring the levels of confidence for preservice teachers under the conditions of this teacher education program and similar programs. The instrument must be interpreted under the assumptions of a multiple factor construct of Computer Confidence, which consists of two major parts: the general computer confidence and efficacy, and the specific computer confidence and self-efficacy. The domain-specific self-efficacy part may consist of as many parts as identified in the manner dictated by the focus for a given teacher preparation program. Those areas should be among the ones that have been empirically identified for their relevance in teaching and learning or

derived from areas in which students show most weakness. In this program for example, preservice teachers indicate a good level of general use (3.8), particularly in the use of wordprocessing (4.2); however, their scores in the areas of communications through networks (E-Mail) are lower (2.3), as well as the areas of use of databases, spreadsheets and on-line CD-ROM databases (2.7).

This instrument must be refined by increasing the number of items in the specific parts of the instrument. An area that needs to be included is the use of multimedia and other interactive systems for learning and teaching (such as multimedia and the use of authoring systems and wide area networks such as the Internet).

Participation in teacher education under this instructional design affects the education students' level of concerns in general as they go from education 202 to education 300-level classes. In this case, the teacher education students, who are younger and have longer life exposure to computers, indicate a higher degree of confidence in general terms of use than their seniors at the Education-300 level; but, the levels of confidence/self-efficacy are higher for the 300-level students who have been longer in teacher education, i.e they are in their second semester in education courses integrating computer technologies in the instructional design. However, the amount of increase in confidence or self-efficacy contributed by

participation in teacher education must be examined and its significance must be clearly determined in a more focused study of program effects.

The reliability coefficients obtained in this study are obviously very high. It has been often argued that high coefficients are obtained when there are very few items in the instrument, which may bias in a positive way the results of the reliability and validity test. Therefore, in order to gain more confidence in the conclusions from this study, the study process for this instrument must continue with more control for alternative explanations of the variation in scores between sub-categories within the group as a sample. The size of the sample on which it is tested and the number of items to include on the instrument parts must be optimized. Also comparisons must be made between teacher education students' performance on this instrument and performance by students who are not enrolled in teacher education--such as the ones who are being prepared for working in any other areas of the helping professions.

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Appendix 1: The Computer Confidence/Self-efficacy Scale

```
WELCOME TO THIS PRACTICE ON BELIEFS ABOUT COMPUTERS AND COMPUTER
TECHNOLOGIES. YOU ARE GOING TO CHECK YOURSELF ON A NUMBER OF
QUESTIONS. AFTER YOU SEE YOUR RESULTS.. YOU WILL DISCUSS THE
ISSUES WITH YOUR INSTRUCTOR AND THE GROUP IN YOUR CLASS. BUT
FIRST.. I WANT TO KNOW A LITTLE MORE ABOUT YOU.

PLEASE PRESS A KEY TO CONTINUE ......
EOQXXXX
                    MY BELIEFS ABOUT COMPUTERS


PRESS A KEY TO START ......
Always use NUMBER keys on top section of Keyboard.
EOQ1XXX
-------------------------------------------------------------------
What Group of the course "THE EDUCATION OF TEACHERS" are YOU in?
-------------------------------------------------------------------
<1> 202

<2> 402

<3> 302

<4> OTHER THAN THE THREE ABOVE
EOQxxxx
-------------------------------------------------------------------
Please identify your gender group
-------------------------------------------------------------------
<1>  male

<2>  female
EOQ0001
-------------------------------------------------------------------
In which of the following age groups are you?
-------------------------------------------------------------------
<1> 18-20 years

<2> 21-24 years

<3> 25-30 years

<4> 31-35 years

<5> 36 or Over
EOQ0002
-------------------------------------------------------------------
With which of the following ethnic groups do you most identify?
-------------------------------------------------------------------
<1> Native American

<2> Asian or Pacific Islander (e.g. China..India..Samoa)

<3> Black (not of Hispanic Origin)

<4> Hispanic (Mexico..Puerto Rico..Central/South America)
```

<5> White (European..North Africa..Middle East..but not Hispanic)

<6> None of the groups above
EOQ0003

What is your student classification?

<1> Frosh

<2> Sophomore

<3> Junior

<4> Senior

<5> Graduate
EOQ0004

What is your expected or present teaching area?

<1> English (Journalism..Literature..Writing..Second Language)

<2> Fine Arts (dance..Music..theatre..drawing..speech)

<3> Home Economics or Industrial Arts

<4> Languages

<5> Mathematics

<6> Physical Education (Wellness Education)

<7> Science

<8> Social Studies(economics..government..psychology..sociology)
<9> Other
EOQ0005

How often do you USE computers and computer technologies for anything?

<1> Never

<2> Occasionally

<3> Weekly

<4> Daily
EOQ0006

What was the approximate percentage of minority students at the high school you attended?

<1> Zero

<2> 1% to 5%

<3> 6% to 10%

<4> 11% to 25%

<5> 26% to 50% or more
EOQ0007
----------NOW MOVE TO THE NEXT SECTION----------

Please indicate the degree to which you agree or disagree with the statements in this section. Your choices will be among the five options:

1 STRONGLY AGREE
2 AGREE
3 NEITHER A OR D
4 DISAGREE
5 STRONGLY DISAGREE

You will have to decide whether you agree or disagree and how strongly you do so after you read the statement you are presented each time. Then press a NUMBER KEY to mark your choice.

-Press any key to continue-
Always use NUMBER KEYS ON TOP SECTION of your Keyboard...

EOQXXXX
---
1. I don't have any use for the computer on a day-to-day basis .

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1001CAS

2. Communicating with others over the computer network can help me be a more effective teacher.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1002CAS

3. Now I am confident about my ability to do well in a course that requires me to use computer technologies.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1003CAS
4. Using computer technologies in my job will only mean more work for me.

<1> Strongly Agree

<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1004CAS

5. I do not think that computer technologies will be useful to me as a teacher.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1005CAS

6. I feel at ease learning about computer technologies.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1006CAS

7. With the use of computer technologies.. I can create instructional materials to enhance my teaching.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1007CAS

8. I am not the kind of person who does do well with computer technologies.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1008CAS

9. If I can use a word processing software.. I will be a more productive teacher.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1009CAS

10. Anything that computer technologies can be used for .. I can do just as well some other way.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1010CAS

11. The thought of using computer technologies frightens me.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1011CAS

12. Computer technologies are confusing to me.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1012CAS

13. I could use computer technologies to access many types of information sources for my work.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1013CAS

14. I do not feel threatened by the impact of computer technologies.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1014CAS

15. I am anxious about computers because I feel like I might break them.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1015CAS

16. Computer technologies can be used to assist me with the classroom management techniques.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1016CAS

17. I don't see how computer technologies can help me learn new skills.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1017CAS

18. I feel comfortable about my ability to work with computer technologies.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1018CAS

19. Knowing how to use computer technologies will not be helpful in my future teaching.

<1> Strongly Agree
<2> Agree
<3> Neither Agree or Disagree
<4> Disagree
<5> Strongly Disagree
EOQ1019CAS

----------NOW MOVE TO THE NEXT SECTION----------

Please indicate the degree to which you agree or disagree with the statements in this section. Your choices will be among the five similar to the options below:

1 STRONGLY AGREE
2 AGREE
3 NEITHER A OR D
4 DISAGREE
5 STRONGLY DISAGREE

You will have to decide whether you agree or disagree and how strongly you do so after you read the statement you are presented each time. Then press a NUMBER KEY to mark your choice.

-Press any key to continue-
Always use NUMBER KEYS ON TOP SECTION of your Keyboard...

EOQXXXX

---

1. I am confident ...

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..using a word processing program to write a letter.. homework or any kind of writing task such as an essay.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I do Not Know
EOQ1020CAS

---

2. I am confident...

...accessing previous files previously created with a word processing program.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I do Not Know
EOQ1021CAS

---

3. I am confident...

....making corrections while using a wordprocessing software package such as Wordperfect.. Microsoft Word and the like.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I do Not Know

EOQ1022CAS

---

4. I am confident...

....formatting texts (e.g. bold..underlines.. fonts) while using a wordprocessing package of software such as Wordperfect.. Microsoft Word and the like.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I do Not Know

EOQ1023CAS

---

5. I am confident...

....moving blocks of text while using a wordprocessing software such as Wordperfect.. Microsoft Word and the like.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all

<5> I do Not Know

EOQ1024CAS

---

6. I am confident...

....using the spell checker while using a wordprocessing software package such as Wordperfect.. Microsoft Word and the like.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I do Not Know
EOQ1025CAS

---

7. I am confident...

....using the search feature in a word processing program such as Wordperfect.. Microsoft Word and the like..

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident At All
<5> I do Not Know
EOQ1026CAS

---

8. I am confident...

....printing out files I have written with a wordprocessing package such as Wordperfect.. Microsoft Word and the like.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1027CAS

---

9. I am confident...

....saving documents I have written with a word processing program.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know

EOQ1028CAS

---

10. I am confident...

...renaming a file created while using a wordprocessing package of software and making a back-up copy for that file.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1029CAS

---

11. I am confident...

. ..logging on to e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1030CAS

---

12. I am confident...

....reading mail-messages on e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1031CAS

---

13. I am confident...

....responding to messages on e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1032CAS

---

14. I am confident...

....deleting messages received on e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1033CAS

---

15. I am confident...

....sending mail messages on e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident

<4> Not Confident at all
<5> I Do Not Know
EOQ1034CAS

---

16. I am confident...

....sending the same mail message to more than one person on e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1035CAS

---

17. I am confident...

....responding privately to messages sent to more than one person on e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1036CAS

---

18. I am confident...

....forwarding messages received on e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1037CAS

---

19. I am confident...

....logging off of e-mail.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1038CAS

---

20. I am confident...

....using a database on compact disc.. such as ERIC or PsycLit Abstracts.

<1> Very Confident
<2> A Little Confident

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<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1039CAS

---

21. I am confident...

....selecting the right database on compact disc for a specific topic relating to my studies.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1040CAS

---

22. I am confident...

....selecting search terms for a database literature search on a selected educational topic.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1041CAS

---

23. I am confident...

....getting into a database on compact disc and starting a literature search on a selected educational topic.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1042CAS

---

24. I am confident...

....using descriptors from a database literature search to obtain a new search terms.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1043CAS

---

26. I am confident...

....using the print function in a data base search on a compact disc.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1044CAS
27. I am confident...

....creating my own database by storing my data and using the database output to incorporate in my lesson design in the classes I teach or in project for classes I am involved in during this semester

---

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1045CAS
28. I am confident...

....creating SPREADSHEET models to use in the management of records for my class activities or in the application of certain data organization principles... 1 am also confident to use such skills and I plan to use them in my class projects.

<1> Very Confident
<2> A Little Confident
<3> Not Quite Confident
<4> Not Confident at all
<5> I Do Not Know
EOQ1046CAS
EOR

APPENDIX 2: Significant Group Difference by level of selected group variables.

2.1: Analysis of Variance for Total Score on the Computer Confidence Scale

VAR	SOURCE OF VAR	Sum of Squares	D.F.	Mean Square	F	Sig.
TERM	Between Gr.	3.3195	1	3.3195	6.8784	.0112*
	Within Gr.	27.0254	56	.4826		
GENDER	Between Gr.	.0698	1	.0698	.1292	.7207
	Within Gr.	30.2750	56	.5406		
COURSE	Between Gr.	.2782	1	.2782	.5181	.4747
	Within Gr.	30.0667	56	.5369		
AGE	Between Gr.	1.9791	2	.9895	1.9186	.1565
	Within Gr.	28.3658	55	.5157		
CLASSRNK	Between Gr.	.7670	2	.3835	.7132	.4946
	Within Gr.	29.5778	55	.5378		
ETHNICIT	Between Gr.	.1226	1	.1226	.2272	.6355
	Within Gr.	30.2222	56	.5397		
TEACHARE	Between Gr.	2.2034	3	.7345	1.4093	.2501
	Within Gr.	28.1415	54	.5211		
HSDIVERS	Between Gr.	.4097	2	.2048	.3734	.6902
	Within Gr.	29.6254	54	.5486		
GNCOMPUS	Between Gr.	10.8782	2	5.4391	15.3673	.0000*
	Within Gr.	19.4667	55	.3539		

Note. * =Significant at p< 0.05

2.2: Analysis of Variance for GENUSE Score on the Computer Confidence Scale

VAR	SOURCE OF VAR	Sum of Squares	D.F.	Mean Square	F	Sig.
COURSE	Between Gr.	.4506	1	.4506	.8122	.3713
	Within Gr.	31.0667	56	.5548		
GENDER	Between Gr.	.0422	1	.0422	.0752	.7850
	Within Gr.	31.4750	56	.5621		
AGE	Between Gr.	1.0354	2	.5177	.9341	.3991
	Within Gr.	30.4818	55	.5542		
CLASSRNK	Between Gr.	1.4728	2	.7364	1.3481	.2682
	Within Gr.	30.0444	55	.5463		
ETHNICIT	Between Gr.	.0025	1	.0025	.0044	.9471
	Within Gr.	31.5147	56	.5628		
TEACHARE	Between Gr.	3.5546	3	1.1849	2.2881	.0889
	Within Gr.	27.9627	54	.5178		
HSDIVERS	Between Gr.	1.0165	2	.5083	.9012	.4121
	Within Gr.	30.4571	54	.5640		
GNCOMPUS	Between Gr.	7.6506	2	3.8253	8.8153	.0005*
	Within Gr.	23.8667	55	.4339		

Note. * =Significant at p< 0.05

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2.3. Analysis of Variance for WPUSE Scores on the Computer Confidence Scale

VAR	Source of Variation	Sum of Squares	D.F.	Mean Square	F	Sig.
TERM	Between Gr.	.2415	1	.2415	.2658	.6082
	Within Gr.	50.8792	56	.9086		
GENDER	Between Gr.	.0346	1	.0346	.0379	.8463
	Within Gr.	51.0861	56	.9123		
AGE	Between Gr.	2.6353	2	1.3177	1.4947	.2333
	Within Gr.	48.4854	55	.8816		
CLASSRNK	Between Gr.	1.1096	2	.5548	.6101	.5469
	Within Gr.	50.0111	55	.9093		
ETHNICIT	Between Gr.	.0141	1	.0141	.0155	.9015
	Within Gr.	51.1066	56	.9126		
TEACHARE	Between Gr.	3.9685	3	1.3228	1.5149	.2211
	Within Gr.	47.1522	54	.8732		
HSDIVERS	Between Gr.	3.8884	2	1.9442	2.2494	.1153
	Within Gr.	46.6730	54	.8643		
GNCOMPUS	Between Gr.	12.5096	2	6.2548	8.9097	.0004*
	Within Gr.	38.6111	55	.7020		

Note. * =Significant at p< 0.05

2.4. Analysis of Variance for COMUSE Scores on the Computer Confidence Scale

VAR	Source of Variation	Sum of Squares	D.F.	Mean Square	F	Sig.
TERM	Between Gr.	12.3969	1	12.3969	11.0711	.0016*
	Within Gr.	62.7065	56	1.1198		
COURSE	Between Gr.	1.5243	1	1.5243	1.1601	.2861
	Within Gr.	73.5792	56	1.3139		
GENDER	Between Gr.	.3923	1	.3923	.2941	.5898
	Within Gr.	74.7111	56	1.3341		
AGE	Between Gr.	.9318	2	.4659	.3455	.7094
	Within Gr.	74.1717	55	1.3486		
CLASSRNK	Between Gr.	3.6368	2	1.8184	1.3994	.2554
	Within Gr.	71.4667	55	1.2994		
ETHNICIT	Between Gr.	1.1034	1	1.1034	.8350	.3647
	Within Gr.	74.0000	56	1.3214		
TEACHARE	Between Gr.	4.2925	3	1.4308	1.0912	.3608
	Within Gr.	70.8109	54	1.3113		
HSDIVERS	Between Gr.	3.0904	2	1.5452	1.1606	.3210
	Within Gr.	71.8921	54	1.3313		
GNCOMPUS	Between Gr.	16.3923	2	8.1962	7.6781	.0011*
	Within Gr.	58.7111	55	1.0675		

Note. * =Significant at p< 0.05

2.5. Analysis of Variance for DTBSPRED Scores on the Computer Confidence Scale

VAR	Source of Variation	Sum of Squares	D.F.	Mean Square	F	Sig.
TERM	Between Gr.	11.6223	1	11.6223	11.5409	.0013*
	Within Gr.	56.3949	56	1.0071		
COURSE	Between Gr.	2.9381	1	2.9381	2.5282	.1175
	Within Gr.	65.0792	56	1.1621		
GENDER	Between Gr.	.0061	1	.0061	.0050	.9436
	Within Gr.	68.0111	56	1.2145		
AGE	Between Gr.	3.5354	2	1.7677	1.5078	.2304
	Within Gr.	64.4818	55	1.1724		
CLASSRNK	Between Gr.	2.6728	2	1.3364	1.1248	.3321
	Within Gr.	65.3444	55	1.1881		
ETHNICIT	Between Gr.	.3528	1	.3528	.2920	.5911
	Within Gr.	67.6644	56	1.2083		
TEACHARE	Between Gr.	1.7689	3	.5896	.4806	.6971
	Within Gr.	66.2484	54	1.2268		
HSDIVERS	Between Gr.	1.6809	2	.8404	.7022	.5000
	Within Gr.	64.6349	54	1.1969		
GNCOMPUS	Between Gr.	12.4506	2	6.2253	6.1618	.0038*
	Within Gr.	55.5667	55	1.0103		

Note. * =Significant at p< 0.05

Appendix 3: Bar Graphs of mean scores for specific categories within the sample

Figure 1: Scores on all three areas of computer confidence for all prospective teachers

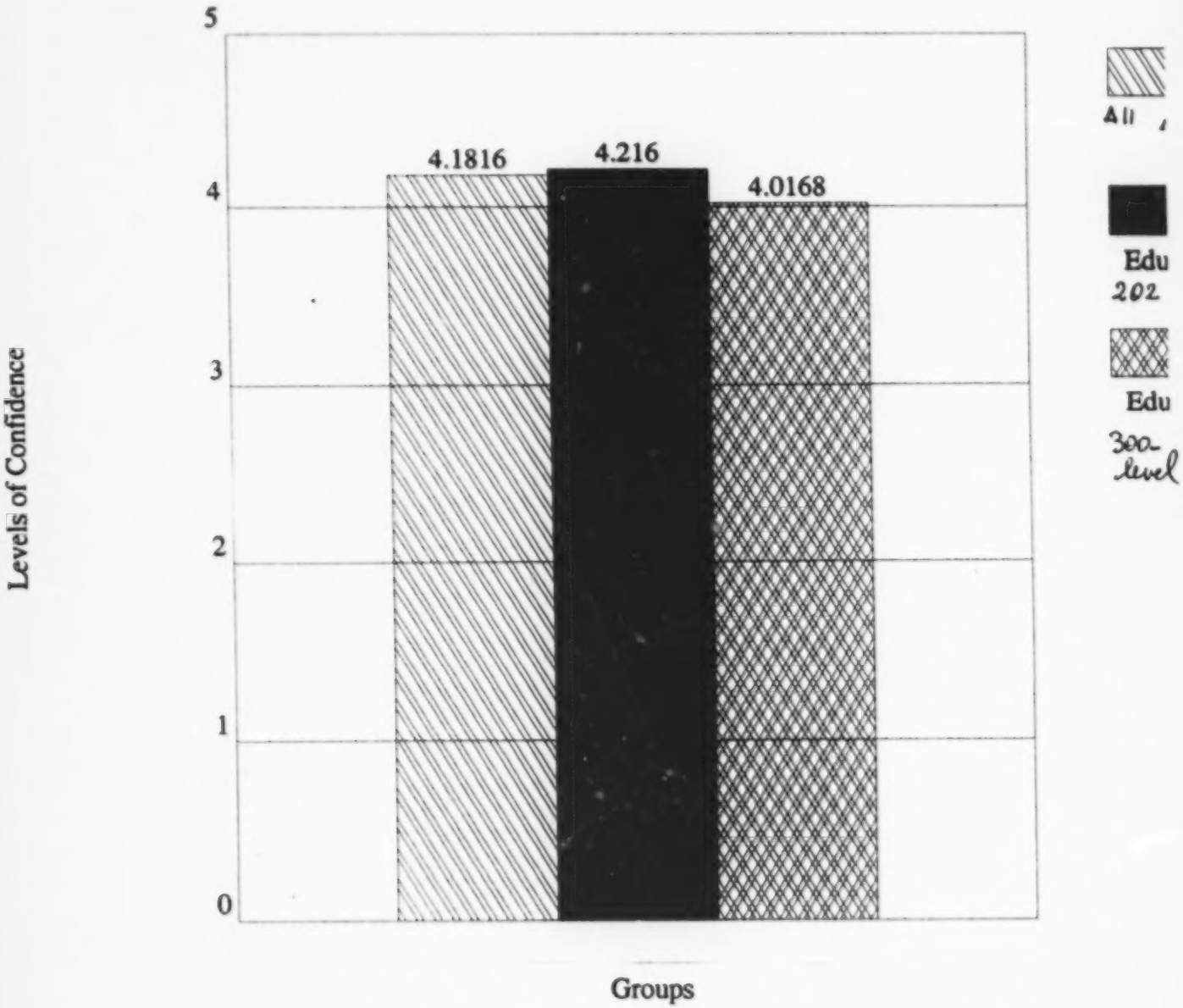

Figure 2: Scores on General Use (GENUSE) for all prospective teachers

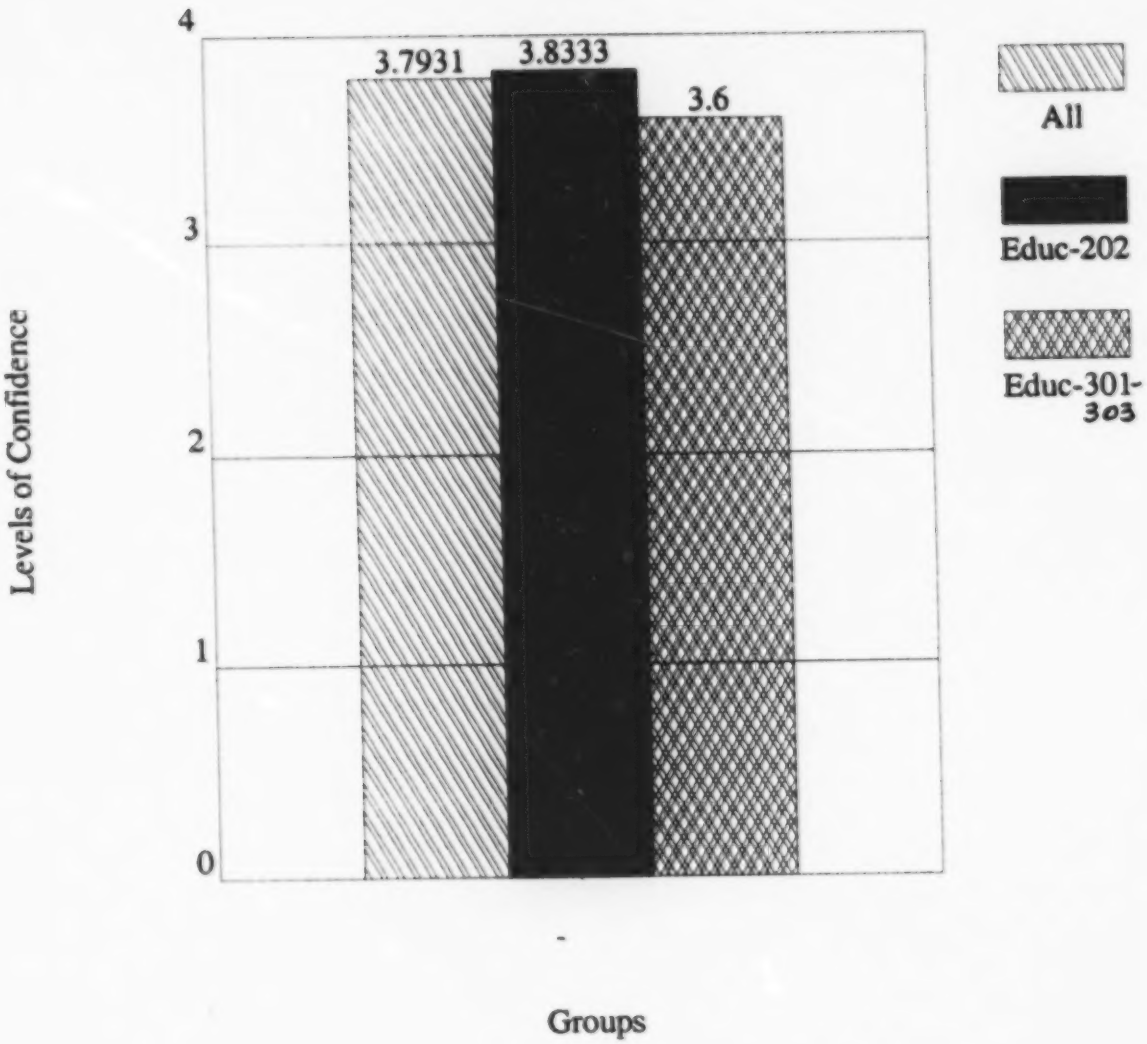

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Figure 3: Scores on wordprocessing (WPUSE) for all prospective teachers

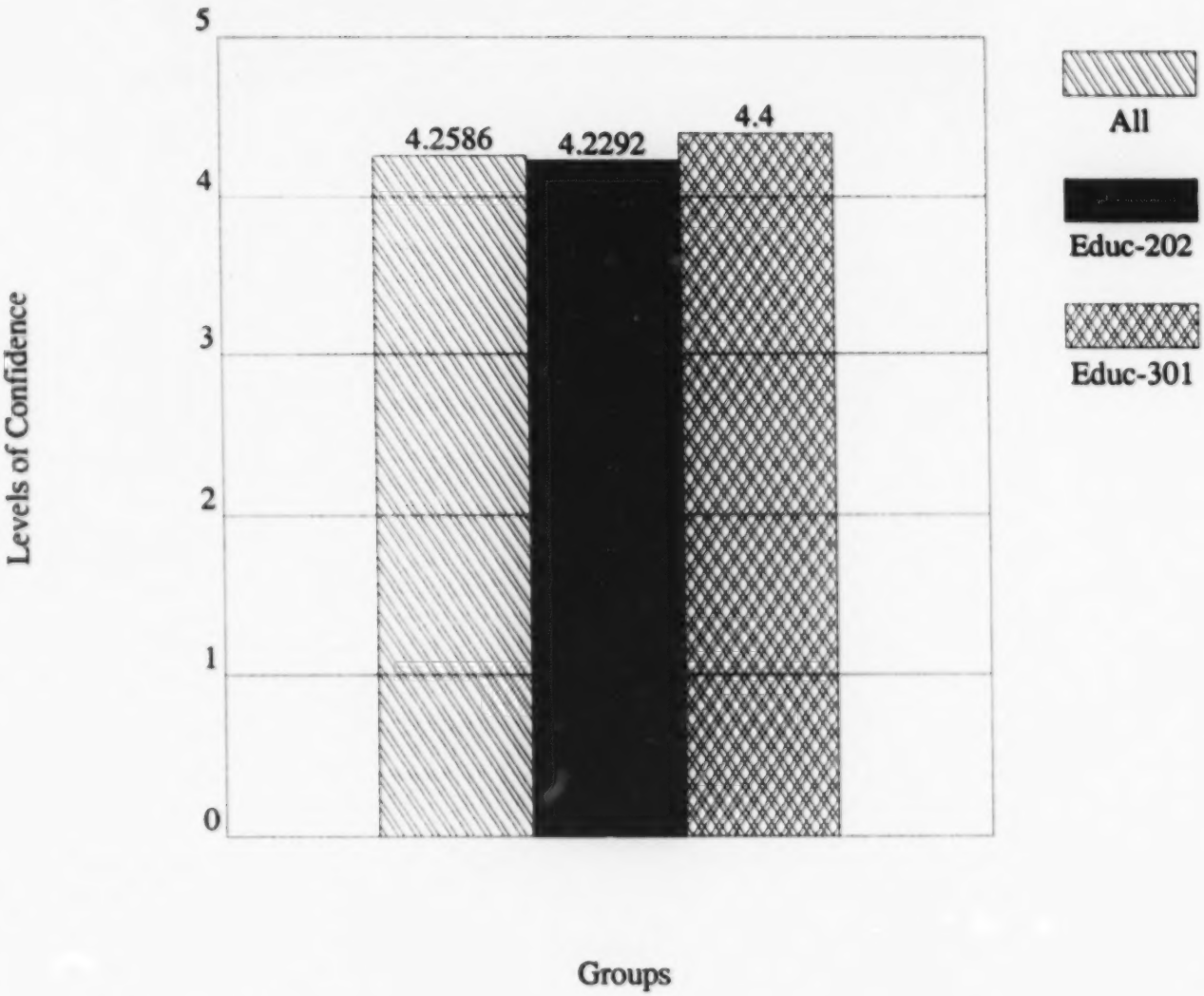

Figure 4: Scores on Communications/Networks use (COMUSE) for all prospective teachers

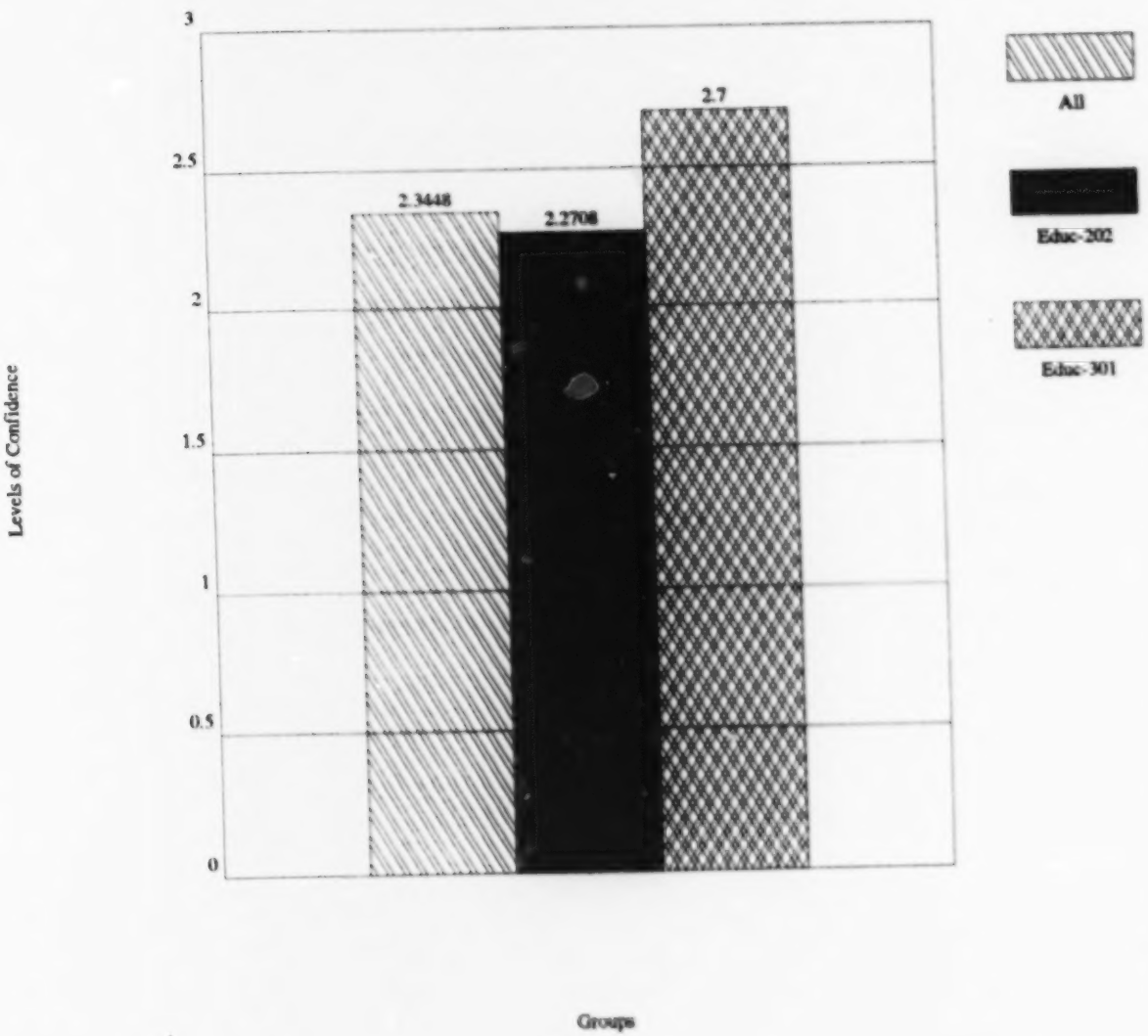

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Figure 5: Scores on use of databases, spreadsheets and on-line CD's for all prospective teachers

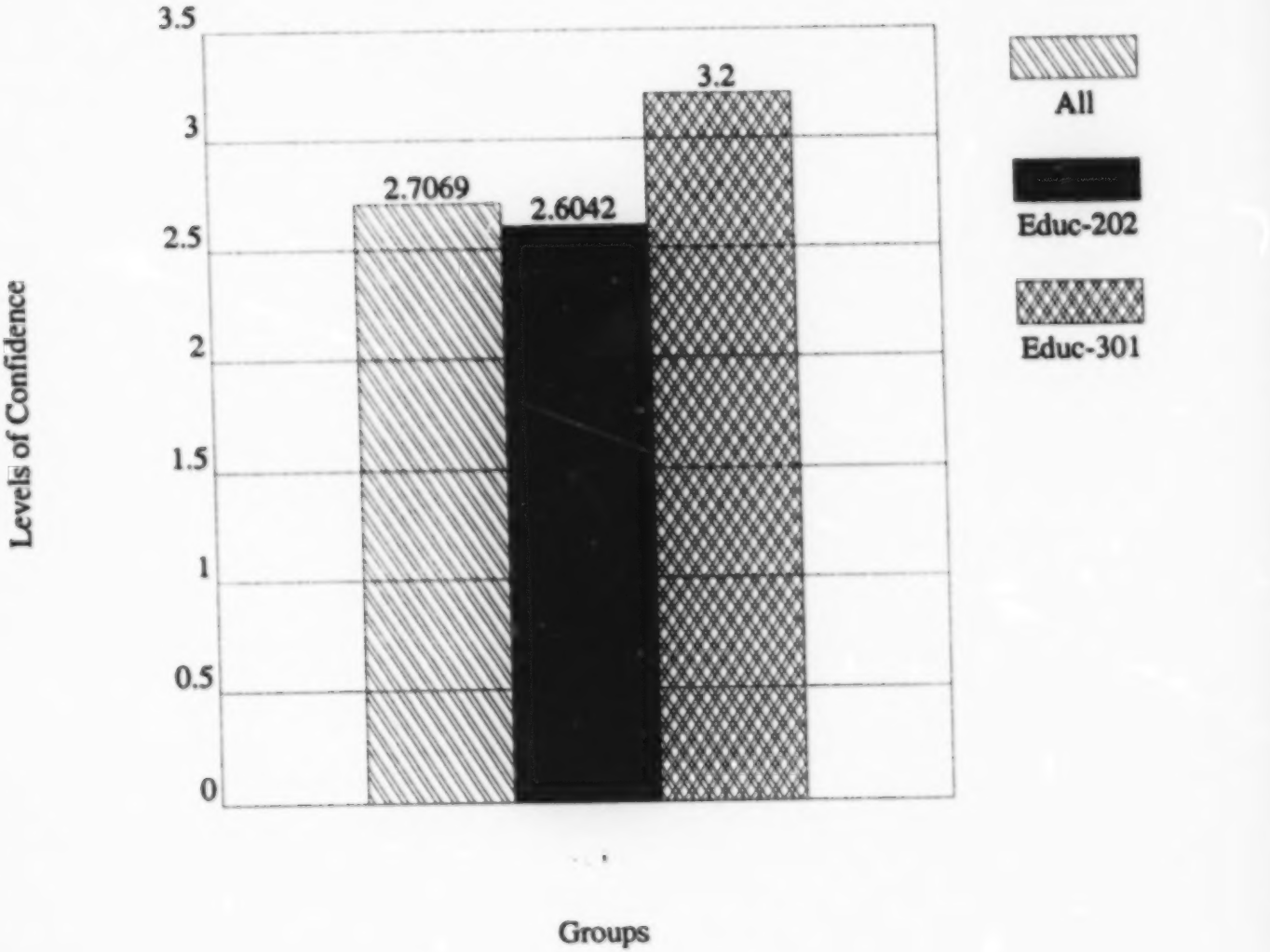

Figure 6: Means for previous experience and computer use habit